SLOVENSKI STANDARD
SIST-TS CEN/TS 17973:2024

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Varnost igrač - Razvrstitev materialov, podobnih sluzi

Safety of toys - Categorization of slime type materials

Sicherheit von Spielzeug - Einstufung von schleimartigen Materialien

Sécurité des jouets - Catégorisation des matériaux de type slime

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Safety of toys - Categorization of slime type materials

Sécurité des jouets - Catégorisation des matériaux de type slime

Sicherheit von Spielzeug - Einstufung von schleimartigen Materialien

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (CEN/TS 17973:2023) has been prepared by Technical Committee CEN/TC 52 “Safety of toys”, the secretariat of which is held by DS.

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Introduction

There have been long lasting discussions on the correct categorization of slime type products in conjunction with testing those products according to EN 71-3 and the applicability of the correct limit value.

Due to their complex behaviour, in many cases a clear distinction cannot be made easily to come to a reliable conclusion on category 1 (pliable) or category 2 (liquid).

As they often present non-Newtonian behaviour on the one hand and/or are creeping rather than free flowing on the other hand the determination of the status appears complex. The stickiness of some compositions needs to be evaluated in a specific way and presents a further challenge.

According to Annex II, Chapter 3, Paragraph (13), the Toy Safety Directive 2009/48/EC differentiates 3 material categories, which are derived on a risk basis from, besides other facts, (*inter alia* RIVM report 320003001/2008 [incl. erratum]) an assumption of daily values for ingestion: category 1 - 100 mg toy material per day/category 2 - 400 mg toy material per day. This was confirmed by SCHER - Final Opinion on Estimates of the amount of toy materials ingested by children as of 8 April 2016, ISBN 978-92-79-ND.

Hand-to-mouth contact (addressing residues on the hands/fingers) is yet addressed within the mentioned RIVM report and therefore addressed by the given limit values. In this conjunction sticky should mean “visible product residues” on fingers and hands (wet feeling does not necessarily reflect the intake of toy material).

For slime-like products, such as toy slime (free-flowing), effect slime (creeping slime masses) and kneading slime (quasi-stable pliable compounds), 2 possible categories come into consideration:

— Category 2: liquid or sticky toy material;

— Category 1: dry, brittle, powder-like or pliable toy material.

Some test institutes as well as market surveillance authorities tend to categorize more conservative into category 2 because of a potentially higher level of protection which leads to different evaluations. This may be not proportionate from the TSD perspective.

The purpose of this document is to give some clarification on slimes and their behaviour, methodology for the characterization as well as an approach for a suitable categorization.

Besides various elements, the element boron is of particular interest for slime-like products which usually obtain their special (non-Newtonian) properties (such as rheopectic or thixotropic behaviour) through the cross-linking of organic components (binders) with the element boron.

For category 1, the migration limit for boron is 1 200 mg/kg toy mass, for category 2 the migration limit is set to 300 mg/kg.

In the context of conformity assessment, it is of particular importance to categorize the slime-type materials correctly for a well-founded evaluation of the test results on the applicable limit value.

Request for a test method proposal

The test method should be easy to use and show acceptable precision for decision making. It must also be pragmatic and may be based on a convention.

1 Scope

This document specifies a test method for categorization of slime-type products to support users of EN 71-3 in the categorization of products with slime-like behaviour into material categories 1 (dry, brittle, powder-like or pliable toy material) or 2 (liquid or sticky toy material).

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

3.1
slime
liquid, semi-liquid or firm material exhibiting free flowing, viscous, paste-like up to creeping behaviour presenting non-Newtonian properties (like rheopexy or thixotropy) and changing the shape over a certain time when left alone

3.2
liquid
free flowing fluid presenting Newtonian behaviour, not keeping any defined shape when not kept in a container

3.3
modelling clay
putty
pliable material exhibiting kneadable behaviour (soft to firm) keeping the shape after manipulation

3.4
creeping
slow steady flow of a viscous material under low stress conditions commonly understood as a specific viscoelastic property

4 Theory

4.1 Historical methods

4.1.1 General

Due to the non-Newtonian behaviour of slime-type products, the standard measurement methods for viscosity are not suitable to obtain reliable results for the categorization.

Furthermore, there is no clear range or point for decision making.

Known provisional methods need mechanical manipulation of the material in preparing the sample for measurement.

4.1.2 Tube test

Cylindrical test tube

Tube dimensions	Diameter 30 mm
	Height min. 60 mm
Procedure	Slime is pressed into the tube and the slime surface is cut flat
	Tube inclination: 90°/45°/0° (different approaches)
	The time for the protrusion of 10 mm of the slime material is taken
Results evaluation	≥ 90 s → category 1
	< 90 s → category 2

Disadvantages of the tube test

— Sample material handling needs some effort to fill the tube properly (e.g. without air bubbles).

— Sample material can be influenced by sweat/fat from the hands and loss of humidity, hand temperature or mechanical forces which may trigger non-Newtonian behaviour.

— The test material needs to be cut at the upper edge of the test tube to have an exact starting point.

— The material cannot be used for further testing.

— No data on reproducibility is available.

— Time taking is not exact because there is no means of a defined end point.

— The test tube material and inclination are not defined and agreed anywhere.

4.1.3 Shape test

A sphere (ball) is shaped from the slime-type toy material with a diameter of 30 mm (as far as it is feasible).

The sphere is placed on a flat horizontal glass, metal or plastic surface and the initial height is determined (H0). The sphere is left for 5 min ((300 ± 5) s). Subsequently the height (H5) is taken.

Results evaluation	If H5 is less than H0/2 or equal to H0/2 → category 2.
	If H5 is more than H0/2→ category 1.

Disadvantages of the shape test

— Sample material handling needs some effort to shape an acceptable sphere (especially with creeping and flexible material or within the transition range of the categories).

— Sample material can be influenced by sweat/fat from the hands and loss of humidity, hand temperature or mechanical forces which may trigger non-Newtonian behaviour.

— Placing the sphere onto a flat surface and measuring the initial height is accompanied by continuous change of the sphere's shape which results in an uncertainty of the starting point (no equilibration is possible prior to measurement).

— The material cannot be used for further testing.

— The optimum sphere diameter is not described nor agreed anywhere.

— No data on reproducibility is available.

— Height determination is variable in its precision depending on the means of measurement (like vernier calliper, which needs to touch the upper surface).

4.2 Newly developed test method – “rod test”

The proposed test method describes an easy-to-use procedure exhibiting an acceptable accuracy for decision making. It is also pragmatic and represents a conventional method.

An advantage of the described method is that the material to be categorized is not subjected to any mechanical influences prior to measurement, e.g. by kneading or moulding or loss of humidity or other effects which enables a uniform and repeatable starting point (see Annex A).

The material can directly be used for migration purposes according to EN 71-3 after categorization.

5 Test procedure for the “rod test”

5.1 Principle

A rod made of polymeric material, preferably POM (polyoxymethylene), is placed onto the surface of a slime-type product and the time of sinking into the material for a certain distance is taken.

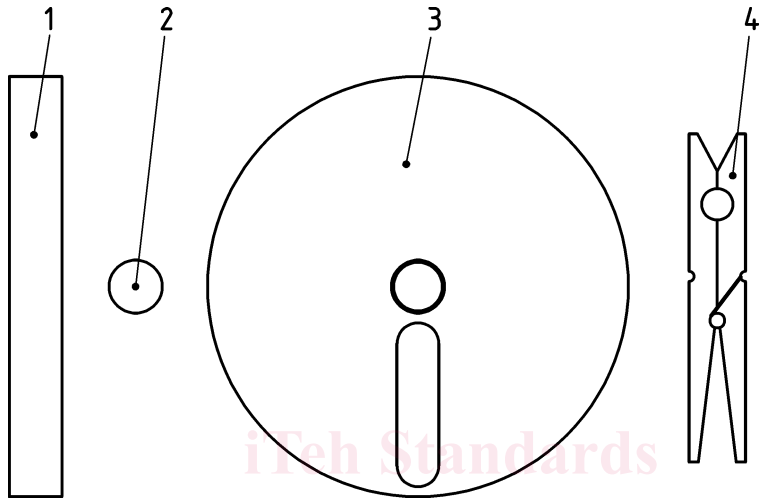
5.2 Test equipment

POM rod	Length	100 mm (drilled hollow from the top for adjusting the weight)
	Diameter	(12,5 ± 0,1) mm
	Contact area	123 mm^2/(= 1,23 cm^2)
	Weight	(10,0 + 0,2) g (including indicator ring)
Guiding tube (POM, PC, ABS)	Inner diameter	(12,8 + 0,1) mm
	Height	20 mm to 25 mm from the base
Base plate (PC, PMMA)	Diameter	100 mm (not less than 70 mm)
	or Square	70 mm × 70 mm
Indicator ring	Height	20 mm
	Inner diameter	about 12 mm (vertically slotted, slidable on the rod, fixed and positioned by friction)
Adjustment clamp	Height	10 mm (for adjusting the indicator ring to the measuring distance)
Test container	Glass beaker	50 ml (standard laboratory glass ware)
	Inner diameter	approx. 40 mm
	Height	approx. 60 mm
	or	original product container (meeting at least the above defined container size specifications as a minimum)
Minimum sample height		30 mm
Maximum sample height		80 % of the height of the container

Minimum test amount	approx. 30 g slime-type material (depending on the density)
Stopwatch	commercially available stopwatch (analogue or digital (resolution at least 0,1 s)

NOTE Considering the minimum sample height as well as the minimum container diameter is crucial to keep the necessary distances of the rod to the container wall.

Examples for the POM rod, the base plate, the indicator ring, and the adjustment clamp are shown in Figure 1.



Key

1 POM rod
2 indicator ring
3 base plate
4 adjustment clamp

Figure 1 — "Rod test" equipment

5.3 Sample preparation

The measurement is conducted at room temperature (21 ± 2) °C.

The pre-conditioning needs an equilibration time of at least 4 h (addressing the temperature as well as the surface flatness) prior to the test. The test container shall be kept closed or covered adequately during equilibration ensuring to minimize loss of humidity from the material.

The surface of the horizontally positioned test material shall be even before measurement.

5.4 Test execution

The measurement set-up and sequence is shown in Figure 2.

To set up the test assembly, the base plate is located on a flat surface and the test rod (equipped with the black distance marker) is placed into the guiding tube (with the closed end down) and fixed by means of the fixation clamp (red).

The test arrangement is placed on the top of the test container and centred. The rod is moved against the resistance of the clamp down onto the ultimate surface of the slime-type material (see images below [**b**]).